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Attorney's Docket No.: 07977/165002/US3379D1

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J. White  
4-17-02

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Shunpei Yamazaki, et al.      Art Unit : 2815  
Serial No.: 09/302,679      Examiner : Lourdes Cruz  
Filed : April 30, 1999  
Title : ELECTRONIC DEVICE AND METHOD FOR MANUFACTURING THE  
SAME

Commissioner for Patents  
Washington, D.C. 20231

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AMENDMENT

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Sir:

In response to the Official Action dated November 30, 2001,  
Paper No. 10, in the above-referenced case, kindly amend the  
above-identified application as follows.

In the Claims:

Please amend the claims as follows.

F<sub>1</sub> 10. A semiconductor device comprising:  
a substrate;  
a film comprising aluminum over said substrate; and  
an insulating film comprising silicon nitride film on said  
film;

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wherein said film contains carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less.

11. A display device comprising:

a substrate;

a gate line over said substrate;

a source line intersected with said gate line over said substrate; and

a pixel at an intersection of said gate line and said source line;

wherein said gate line comprises aluminum and

carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less, and

wherein an insulating film comprising silicon nitride film is formed on said gate line.

12. A display device comprising:

a substrate;

a thin film transistor over said substrate, said thin film transistor having a source region, a drain region, a channel region between said source and drain region, and a gate electrode over said channel region;

an insulating film comprising silicon nitride film on said gate electrode;

an interlayer insulating film over said thin film transistor;

607 a wiring connected to at least said source region or drain region through a contact hole; and

a pixel electrode over said interlayer insulating film, wherein said gate electrode and wiring are formed from a film comprising aluminum, and

wherein said film contains carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less.

13. A semiconductor device comprising:

a substrate; and

a film comprising aluminum over said substrate,

wherein said film contains carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less and oxygen atoms at a concentration of  $8 \times 10^{18}$  atoms·cm<sup>-3</sup> or less.

14. A display device comprising:

a substrate;

a gate line over said substrate;

a source line intersected with said gate line; and

a pixel at an intersection of said gate line and said source line,

wherein said gate line comprises aluminum,  
carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or  
less and oxygen atoms at a concentration of  $8 \times 10^{18}$  atoms·cm<sup>-3</sup> or  
less.

15. A semiconductor device comprising:

a substrate;

a thin film transistor over said substrate, said thin film  
transistor having a source region, a drain region, a channel  
region between said source and drain region, a gate electrode  
over said channel region;

an interlayer insulating film over said thin film  
transistor;

a wiring connected to said source or drain region through a  
contact hole; and

a pixel electrode over said interlayer insulating film,  
wherein said gate electrode and wiring are formed from a  
film comprising aluminum, and

wherein said film contains carbon atoms at a concentration  
of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less and oxygen atoms at a concentration  
of  $8 \times 10^{18}$  atoms·cm<sup>-3</sup> or less.

B<sub>2</sub> 16. A semiconductor device according to claim 13, wherein an insulating film comprising silicon nitride film is formed on said film.

17. A display device according to claim 14, wherein an insulating film comprising silicon nitride film is formed on said gate line.

18. A display device according to claim 15, wherein an insulating film comprising silicon nitride film is formed on said gate electrode.

19. A semiconductor device according to claim 40, wherein an insulating film comprising silicon nitride film is formed on said film.

20. A display device according to claim 41, wherein an insulating film comprising silicon nitride film is formed on said gate line.

21. A display device according to claim 42, wherein an insulating film comprising silicon nitride film is formed on said gate electrode.

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F3 34. A semiconductor device according to claim 10, wherein said semiconductor device is an electroluminescence display device.

F4 35. A semiconductor device according to claim 10, wherein said semiconductor device is a TV camera.

36. A semiconductor device according to claim 10, wherein said semiconductor device is a personal computer.

37. A semiconductor device according to claim 10, wherein said semiconductor device is a car navigation system.

38. A semiconductor device according to claim 10, wherein said semiconductor device is a TV projection system.

39. A semiconductor device according to claim 10, wherein said semiconductor device is a video camera.

Please add the following new claims.

F5 40. (New) A semiconductor device comprising:  
a substrate; and  
a film comprising aluminum over said substrate,

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cont

wherein said film contains carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less and nitrogen atoms at a concentration of  $7 \times 10^{17}$  atoms·cm<sup>-3</sup> or less.

41. (New) A display device comprising:

a substrate

a gate line over said substrate;

a source line intersected with said gate line over said substrate; and

a pixel at an intersection of said gate line and said source line;

wherein said gate line comprises aluminum, carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less and nitrogen atoms at a concentration of  $8 \times 10^{18}$  atoms·cm<sup>-3</sup> or less.

42. (New) A display device comprising:

a substrate;

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a thin film transistor over said substrate, said thin film transistor having a source region, a drain region, a channel region between said source and drain region, a gate electrode over said channel region;

an interlayer insulating film over said thin film transistor;

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cont*  
a wiring connected to said source or drain region through a contact hole, and

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a pixel electrode over said interlayer insulating film, wherein said gate electrode and wiring are formed from a film comprising aluminum, and

wherein said film contains carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less and oxygen atoms at a concentration of  $8 \times 10^{18}$  atoms·cm<sup>-3</sup> or less.

*44* 43. (New) A display device according to claim 11, wherein said display device is an electroluminescence display device.

44. (New) A display device according to claim 11, wherein said display device is provided in a TV camera.

45. (New) A display device according to claim 11, wherein said display device is provided in a personal computer.

46. (New) A display device according to claim 11, wherein said display device is provided in a car navigation system.

47. (New) A display device according to claim 11, said display device is provided in a TV projection system.



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cont 48. (New) A display device according to claim 11, said  
display device is provided in a video camera.

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5/3 49. (New) A display device according to claim 12, said  
display device is a electroluminescence display device.

11/1 50. (New) A display device according to claim 12, wherein  
said display device is provided in a TV camera.

51. (New) A display device according to claim 12, wherein  
said display device is provided in a personal computer.

52. (New) A display device according to claim 12, wherein  
said display device is provided in a car navigation system.

53. (New) A display device according to claim 12, said  
display device is provided in a TV projection system.

54. (New) A display device according to claim 12, said  
display device is provided in a video camera.

11/2  
11/2 55. (New) A semiconductor device according to claim 13,  
wherein said semiconductor device is an electroluminescence  
display device.

For  
ant 56. (New) A semiconductor device according to claim 13  
wherein said semiconductor device is a TV camera.

57. (New) A semiconductor device according to claim 13,  
wherein said semiconductor device is a personal computer.

58. (New) A semiconductor device according to claim 13,  
wherein said semiconductor device is a car navigation system.

59. (New) A semiconductor device according to claim 13,  
said semiconductor device is a TV projection system.

60. (New) A semiconductor device according to claim 13,  
said semiconductor device is a video camera.

61. (New) A display device according to claim 14, wherein  
said display device is an electroluminescence display device.

62. (New) A display device according to claim 14, wherein  
said display device is provided in a TV camera.

63. (New) A display device according to claim 14, wherein  
said display device is provided in a personal computer.

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cont

7u 64. (New) A display device according to claim 14, wherein said display device is provided in a car navigation system.

7u 65. (New) A display device according to claim 14, said display device is provided in a TV projection system.

7u 66. (New) A display device according to claim 14, said display device is provided in a video camera.

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7u 67. (New) A display device according to claim 15, wherein said display device is an electroluminescence display device.

7u 68. (New) A display device according to claim 15, wherein said display device is provided in a TV camera.

7u 69. (New) A display device according to claim 15, wherein said display device is provided in a personal computer.

7u 70. (New) A display device according to claim 15, wherein said display device is provided in a car navigation system.

7u 71. (New) A display device according to claim 15, said display device is provided in a TV projection system.

<sup>F5</sup>  
<sup>627</sup> 72. (New) A display device according to claim 15, said display device is provided in a video camera.

<sup>112</sup>  
<sup>114</sup> 73. (New) A semiconductor device according to claim 40, wherein said semiconductor device is an electroluminescence display device.

<sup>112</sup>  
<sup>114</sup> 74. (New) A semiconductor device according to claim 40, wherein said semiconductor device is a TV camera.

<sup>112</sup>  
<sup>114</sup> 75. (New) A semiconductor device according to claim 40, wherein said semiconductor device is a personal computer.

<sup>112</sup>  
<sup>114</sup> 76. (New) A semiconductor device according to claim 40, wherein said semiconductor device is a car navigation system.

<sup>112</sup>  
<sup>114</sup> 77. (New) A semiconductor device according to claim 40, said semiconductor device is a TV projection system.

<sup>112</sup>  
<sup>114</sup> 78. (New) A semiconductor device according to claim 40, said semiconductor device is a video camera.

<sup>112</sup>  
<sup>114</sup> 79. (New) A display device according to claim 41, wherein said display device is an electroluminescence display device.

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cont

JM 80. (New) A display device according to claim 41, wherein said display device is provided in a TV camera.

JM 81. (New) A display device according to claim 41, wherein said display device is provided in a personal computer.

JM 82. (New) A display device according to claim 41, wherein said display device is provided in a car navigation system.

JM 83. (New) A display device according to claim 41, said display device is provided in a TV projection system.

JM 84. (New) A display device according to claim 41, said display device is provided in a video camera.

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~~85. (New) A display device according to claim 42. wherein said display device is an electroluminescence display device.~~

JM 86. (New) A display device according to claim 42, wherein said display device is provided in a TV camera.

JM 87. (New) A display device according to claim 42, wherein said display device is provided in a personal computer.

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88. (New) A display device according to claim 42, wherein  
said display device is provided in a car navigation system.

89. (New) A display device according to claim 42, said  
display device is provided in a TV projection system.

90. (New) A display device according to claim 42, said  
display device is provided in a video camera.

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REMARKS

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Reconsideration and allowance of the above-referenced application are respectfully requested.

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Claims 10 and 16 stand rejected under 35 U.S.C. 102(e) as allegedly being anticipated by U.S. Patent No. 5,594,280 to Sekiguchi. The rejection contends that Sekiguchi discloses a film pattern that has aluminum with carbon atoms at a concentration of  $5 \times 10^{18}$  atoms $\cdot$ cm $^{-3}$  or less (column 17, lines 59+ of Sekiguchi). In fact, Sekiguchi teaches an aluminum film with carbon mixture of an amount equal to or less than 20 ppm (atoms/cc). It is respectfully suggested that the teaching of 20 ppm in atoms/cc does not translate to  $5 \times 10^{18}$  atoms $\cdot$ cm $^{-3}$ . In fact, Sekiguchi does not meet the Patent Office's burden of providing a *prima facie* showing of unpatentability, since the teaching of less than 20 ppm in atoms/cc does not teach or suggest the claimed feature of  $5 \times 10^{18}$  atoms $\cdot$ cm $^{-3}$  or less, as claimed.)

Moreover, even if the rejection is correct, and Sekiguchi does teach the claimed concentration range, it is still respectfully suggested that the claims as amended are patentably distinguished thereover. Claims 10-12 recite that a silicon nitride film is formed on a film comprising aluminum. This feature produces the significant advantage of preventing generations of hillocks or whiskers on the surface of the gate

electrode during the doping impurity and irradiating. This is explained in the specification on page 13, lines 25 through page 14, line 6. Moreover, Sekiguchi does not teach or suggest this feature.

Claims 13-15 recite that a film comprising aluminum has carbon atoms at a concentration of  $5 \times 10^{18}$  atoms·cm<sup>-3</sup> or less, and oxygen atoms at a concentration of  $8 \times 10^{18}$  atoms·cm<sup>-3</sup> or less. Claims 40-42 recite that the film with aluminum has carbon atoms at a concentration of  $5 \times 10^{18}$  or less, and nitrogen atoms at a concentration of  $7 \times 10^{17}$  atoms·cm<sup>-3</sup> or less. Again, these features produce the advantage of preventing the generation of hillocks by decreasing the concentration of oxygen, carbon, and nitrogen. This is also clearly explained at page 18, lines 6-15, in the specification.

Sekiguchi does not teach this specific concentration of oxygen and nitrogen, and therefore it is respectfully suggested that all of these claims should be allowable for this reason.

In view of the above amendments and remarks, therefore, all of the claims should be in condition for allowance. A formal notice to that effect is respectfully solicited.



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No. 06-1050.

Respectfully submitted,

Date: \_\_\_\_\_

*2/27/02*

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